Relation between mixed venous oxygen saturation and cerebral oxygen saturation measured by absolute and relative near-infrared spectroscopy

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Background

Previously reported contradictory results regarding the equivalence of mixed venous oxygen saturation (S_vO_2) and regional cerebral oxygen saturation (rS_cO_2) might be related to the measurement technology.

In order to explore this hypothesis, we designed a prospective clinical study comparing continuously measured S_vO_2 with relative (INVOS 5100, Somanetics Corporation, Troy, MI) and absolute (Foresight, CAS Medical Systems, Branford, CT, USA) rS_cO_2 measurements.

Methods

- 42 patients undergoing elective off-pump coronary bypass grafting were enrolled.
- 2 INVOS and 2 Foresight sensors registered rS_cO_2. S_vO_2 was measured continuously via a pulmonary artery catheter.
- Data were assessed by within- and between-group comparisons and correlation analysis. Agreement was assessed with Bland-Altman analysis.

Results

- INVOS had a wider range in rS_cO_2 values (Fig 1).
- Both monitors revealed similar correlation coefficients between rS_cO_2 and S_vO_2 (Fig 2).
- Bland-Altman analysis of agreement between rS_cO_2 and S_vO_2 showed a mean bias of 5.0% with limits of agreement of -7.7% and 17.7% for Foresight, and a mean bias of 8.8% with limits of agreement of -11.2% and 28.8% for INVOS.
- Magnitude of rS_cO_2 changes during haemodynamic alterations was significantly lower with Foresight compared to INVOS (Fig 3).

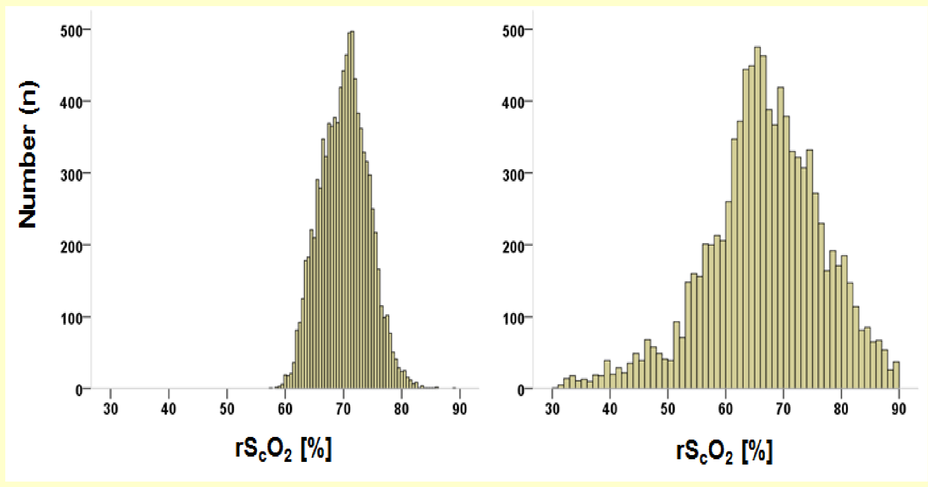

Fig 1. INVOS (right panel) had a wider range in rS_cO_2 values compared to Foresight (left panel)

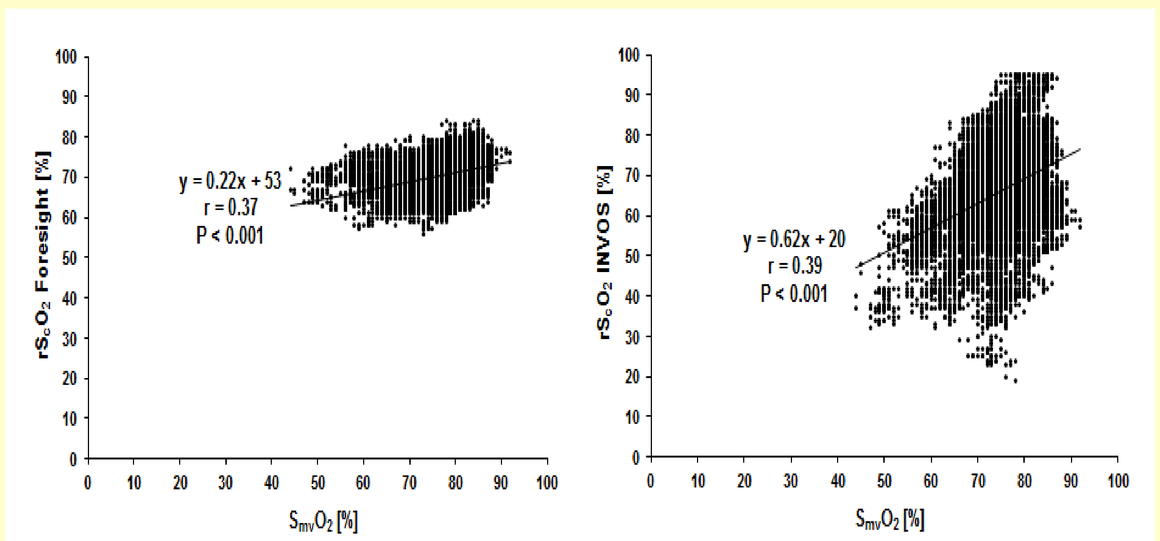

Fig 2. Correlation analysis between S_vO_2 and rS_cO_2 measured with Foresight (left panel) and INVOS (right panel)

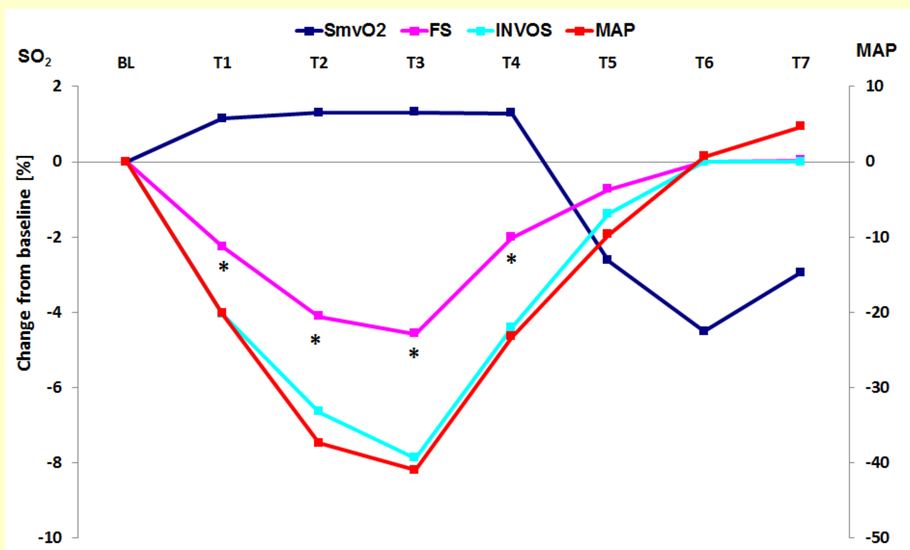

Fig 3. Relative changes in S_vO_2 and rS_cO_2 during placement of deep pericardial stitches (* $p<0.05$ Foresight vs. INVOS)

Conclusion

- Both absolute and relative rS_cO_2 measurements revealed poor correlation and wide limits of agreement between S_vO_2 and rS_cO_2 .
- Foresight rS_cO_2 might underestimate the actual S_vO_2 values during OPCAB surgery.